PB89-220487

Guidance Document for the WRITE (Waste Reduction Innovative Technology Evaluation) Pilot Program with State and Local Governments

PEI Associates, Inc., Cincinnati, OH

Prepared for:

Environmental Protection Agency, Cincinnati, OH

Aug 89

U.S. Department of Commerce
National Technical Information Service
NTIS

PB89-220487

EPA/600/8-89/070
August 1989

GUIDANCE DOCUMENT FOR THE WRITE PILOT PROGRAM WITH STATE AND LOCAL GOVERNMENTS

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Contract No. 68-03-3389
Work Assignment No. 2-14

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U.S. DEPARTMENT OF COMMERCE
NATIONAL TECHNICAL INFORMATION SERVICE
SPRINGFIELD, VA. 22161

TECHNICAL REPORT DATA (Please read Instructions on the reverse before completing)		
1. REPORT NO. EPA/600/8-89/070	2.	3. RECIPIENT'S ACCESSION NO. PB89 220487/AS
4. TITLE AND SUBTITLE Guidance Document for the WRITE Pilot Program with State and Local Governments		5. REPORT DATE August 1989
		6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S) M. L. Apel and H. M. Freeman (1) and M. F. Szabo and S. Ambekar (2)		8. PERFORMING ORGANIZATION REPORT NO.
9. PERFORMING ORGANIZATION NAME AND ADDRESS (1) U.S. EPA, RREL Cincinnati, Ohio 45268 (2) PEI Associates, Inc. Cincinnati, Ohio 45246		10. PROGRAM ELEMENT NO.
		11. CONTRACT/GRANT NO. 68-03-3389
12. SPONSORING AGENCY NAME AND ADDRESS Risk Reduction Engineering Laboratory-Cincinnati, OH Office of Research and Development U. S. Environmental Protection Agency Cincinnati, OH 45268		13. TYPE OF REPORT AND PERIOD COVERED Complete
		14. SPONSORING AGENCY CODE EPA/600/14
15. SUPPLEMENTARY NOTES		

16. ABSTRACT This guidance document provides an overview of a new research demonstration program designed to evaluate the use of innovative engineering and scientific technologies to reduce the volume and/or toxicity of wastes produced from the manufacture, processing and use of materials. The "WRITE Pilot Program With State and Local Governments" is a major component of a national pollution prevention research program called the "Waste Reduction Innovative Technology Evaluation" (WRITE) Program. The WRITE program is broad in technical scope and addresses the reduction of pollutants across all environmental media: air, land, surface water and ground water. Under this pilot program technical and economic evaluations of source reduction and recycling technologies are being conducted through the joint efforts of various State and local governments and EPA. Information obtained under this program will assist Federal, State and Local Governments as well as small and mid-size industries in evaluating waste reduction technologies by providing reliable performance and cost information on pollution prevention technologies. This research will also serve to accomplish an early introduction of waste reduction techniques into broad commercial practice.

17. KEY WORDS AND DOCUMENT ANALYSIS		
a. DESCRIPTORS	b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Waste Minimization Source Reduction Hazardous Waste Recycling	Solid Waste Emerging Technologies Waste Reduction Industrial Wastes	
18. DISTRIBUTION STATEMENT Release to Public	19. SECURITY CLASS (This Report) Unclassified	21. NO. OF PAGES 43
	20. SECURITY CLASS (This page) Unclassified	22. PRICE

EPA Form 2220-1 (Rev. 4-77) PREVIOUS EDITION IS OBSOLETE

DISCLAIMER

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FOREWORD

Today's rapidly developing and changing technologies and industrial products and practices frequently carry with them the increased generation of materials that, if improperly dealt with, can threaten both the public health and the environment. The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. These laws direct the EPA to perform research to define our environmental problems, measure the impacts, and search for solutions.

The Risk Reduction Engineering Laboratory is responsible for planning, implementing, and managing research, development, and demonstration programs to provide an authoritative, defensible engineering basis in support of the policies, programs, and regulations of the EPA with respect to drinking water, wastewater, pesticides, toxic substances, solid and hazardous wastes, and Superfund-related activities. This publication is one of the products of that research and provides a vital communication link between the researcher and the user community.

This guidance document provides an overview of a new research demonstration program designed to evaluate the use of innovative engineering and scientific technologies to reduce the volume and/or toxicity of wastes produced from the manufacture, processing, and use of materials. The "WRITE Pilot Program With State and Local Governments" is a major component of a national pollution prevention research program called the "Waste Reduction Innovative Technology Evaluation" (WRITE) Program. The WRITE Program is broad in technical scope and addresses the reduction of pollutants across all environmental media: air, land, surface water, and ground water. Under this pilot program, technical and economic evaluations of source reduction and recycling technologies are being conducted through the joint efforts of various State and local governments and EPA. Information obtained under this program will assist Federal, State, and local governments, as well as small- and mid-size industries in evaluating waste reduction technologies by providing reliable performance and cost information on pollution prevention technologies. This research will also serve to accomplish an early introduction of waste reduction techniques into broad commercial practice.

E. Timothy Oppelt, Director
Risk Reduction Engineering Laboratory

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EXECUTIVE SUMMARY

The "Waste Reduction Innovative Technology Evaluation (WRITE) Pilot Program With State and Local Governments" is a major component of a new national research program being undertaken by the U.S. Environmental Protection Agency (EPA) called the "Waste Reduction Innovative Technology Evaluation (WRITE) Program." The WRITE Program is implemented by the Waste Minimization Branch (WMB) of the Office of Research and Development of EPA's Risk Reduction Engineering Laboratory in Cincinnati. This guidance document provides an overview of the "WRITE Pilot Program With State and Local Governments," presents its goals, and explains the general policy regarding funding and execution.

The WRITE Program is a research demonstration program designed to evaluate the use of innovative engineering and scientific technologies to reduce the volume and/or toxicity of wastes produced from the manufacture, processing, and use of materials. It encourages the interaction of government and industry in the demonstration and evaluation of available innovative production and recycling options for reducing waste generation. Research under the WRITE Program supports the intent of the 1984 Amendments to the Resource Conservation and Recovery Act, which is to reduce the amount of hazardous and nonhazardous waste produced in the United States and to encourage the adoption of pollution-prevention practices and technologies.

Under the "WRITE Pilot Program With State and Local Governments," technical and economic evaluations are being conducted of manufacturing, processing, and use operations in which pollution-prevention techniques reduce the volume and/or toxicity of waste generated. These evaluations are being funded through the joint efforts of the EPA and various State and local governments. This joint approach was chosen because State and local government officials are familiar with local industrial practices and regional manufacturing and economic interests that can affect the potential success and widespread applicability of proposed pollution-prevention technologies. This pilot program is being conducted to determine the success of incorporating pollution-prevention technologies and practices in industrial operations through Federal and State cooperative efforts.

Because the EPA is already devoting considerable effort and funding to waste treatment under other Agency programs [e.g., the Superfund Innovative Technology Evaluation (SITE) Program], research efforts under the WRITE Program focus primarily on source reduction and the recycling and reuse of waste materials.

Further information concerning the WRITE Program can be obtained by contacting M. Lynn Apel of the Waste Minimization Branch. Written correspondence and inquiries for additional information concerning this and other

research and development programs in pollution prevention should be directed to:

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SECTION 1

INTRODUCTION

Passage of the 1984 Hazardous and Solid Waste Amendments (HSWAs) to the Resource Conservation and Recovery Act (RCRA) of 1976 marked a strong change in the U.S. policies concerning the generation of hazardous and nonhazardous wastes. In addition to authorizing very stringent treatment and disposal regulations, the Amendments also indicated (as the Nation's top waste management priority) a redirection toward "waste minimization" as a preferential strategy for encouraging improvement in environmental quality.

To carry out the intent of the Amendments to reduce the generation of waste in the United States, the U.S. Environmental Protection Agency (EPA) has developed a comprehensive pollution-prevention program addressing the release and transport of hazardous, toxic, and nonhazardous materials through air, water, and solid media. The EPA pollution-prevention program includes information gathering, research and development, demonstration, support of State/municipality waste-minimization and pollution-prevention programs, training and education, technology transfer activities, waste-minimization assessments, and extensive communication with universities, State and local governments, and the general public. The part of the EPA program concerned with research, development, and demonstration of pollution-prevention technologies is the responsibility of the Waste Minimization Branch of the Risk Reduction Engineering Laboratory of the Office of Research and Development in Cincinnati, Ohio.

This document describes one of the pollution-prevention activities being undertaken by the Agency. The "Waste Reduction Innovative Technology Evaluation (WRITE) Program" has been designed to identify, evaluate, and/or demonstrate new ideas and technologies that lead to waste reduction. The "WRITE Pilot Program With State and Local Governments" involves the cooperative efforts of the EPA, State and local governments, private industry, and other organizations to encourage the development and/or demonstration of effective techniques and technologies for pollution prevention.

SECTION 2

BACKGROUND

During the last decade, waste management and disposal regulations have changed drastically. During the 1970's, the seriousness of the hazardous waste problem became apparent and prompted enactment of the Resource Conservation and Recovery Act (RCRA) in 1976. Since that time, the increasing quantity of waste generated in the United States and its effect on human health and the environment have received significant attention from the public, EPA, and industry. By the early 1980's, it had become apparent that even well-regulated land disposal could cause significant environmental damage. The 1984 Hazardous and Solid Waste Amendments (HSWAs) to RCRA have resulted in the banning of the land disposal of some 400 chemicals and hazardous wastes.

During the 1980's, significant effort was devoted to research, development, and commercialization of hazardous waste treatment technologies. Although some efforts were successful in substantially mitigating the problem of existing waste, it became apparent that treatment alone would not solve all of the problems associated with the increasing amounts of hazardous and nonhazardous waste being generated.

Congress recognized this fact while drafting the national policy on hazardous wastes and directed EPA to report on the feasibility and desirability of developing mandatory requirements to compel the adoption of pollution-prevention techniques. The 1984 HSWAs to RCRA define the national policy on hazardous waste management as follows:

> "The Congress hereby declares it to be the national policy of the United States that, wherever feasible, the generation of hazardous waste is to be reduced or eliminated as expeditiously as possible. Waste that is nevertheless generated should be treated, stored, or disposed of so as to minimize the present and future threat to human health and the environment." [1]

The following are three statutory requirements for generators:

1) They must certify on their waste manifests that they have in place a program "to reduce the volume or quantity and toxicity of such waste to the degree determined by the generator to be economically practicable;"

2) They must make the same certification in relation to any new permit issued for treatment, storage, or disposal of hazardous waste; and

3) They must describe in a biennial report to EPA any waste minimization program and accomplishment during the reporting period.

DEFINITION OF WASTE MINIMIZATION

In 1986, EPA responded to the Congressional request in the HSWAs with a Report to Congress on the Minimization of Hazardous Waste [2]. In this report, the Agency defined waste minimization as:

> "The reduction, to the extent feasible, of hazardous waste that is generated or subsequently treated, stored or disposed of. It includes any source reduction or recycling activity undertaken by a generator that results in either (1) the reduction of total volume or quantity of hazardous waste or (2) the reduction of toxicity of hazardous waste, or both, so long as the reduction is consistent with the goal of minimization of present and future threats to human health and environment."

The EPA's definition of waste minimization includes source reduction and recycling, the first two elements in the Waste Management Hierarchy shown in Table 1 [3]. Source reduction and recycling each comprise practices and procedures as those shown in Figure 1.

EPA'S WASTE MINIMIZATION PROGRAM

In its Report to Congress, the Agency explored various technical, economic, and policy issues relevant to the reduction and recycling of hazardous and nonhazardous wastes, and concluded that it would be counterproductive for EPA to establish a mandatory program for waste minimization at this time. This conclusion was based on three key factors. First, mandatory programs would "second-guess" industry's production decisions and quite possibly produce counterproductive results. Second, mandatory programs would be difficult and expensive to design and administer. Third, generators already face strong economic incentives to reduce their wastes. A regulatory program

TABLE 1. WASTE MANAGEMENT HIERARCHY

- Source Reduction: The reduction or elimination of waste at the source, usually within a process. Source reduction measures include process modifications, feedstock substitutions, improvements in feedstock purity, housekeeping and management practice changes, increases in the efficiency of equipment, and recycling within a process.

- Recycling: The use or reuse of a waste material as an effective substitute for a commercial product or as an ingredient or feedstock in an industrial process. It includes the reclamation of useful constituent fractions within a waste material or the removal of contaminants from a waste to allow it to be reused.

- Treatment: Any method, technique or process that changes the physical, chemical, or biological character of any waste so as to neutralize such waste, to recover energy or material resources from the waste, or to render such waste nonhazardous, less hazardous, safer to manage, amenable for recovery, amenable for storage, or reduced in volume.

- Disposal: The discharge, deposit, injection, dumping, spilling, leaking, or placing of waste into or on any land or water so that such waste or any constituents may enter the air or be discharged into any waters, including ground water.

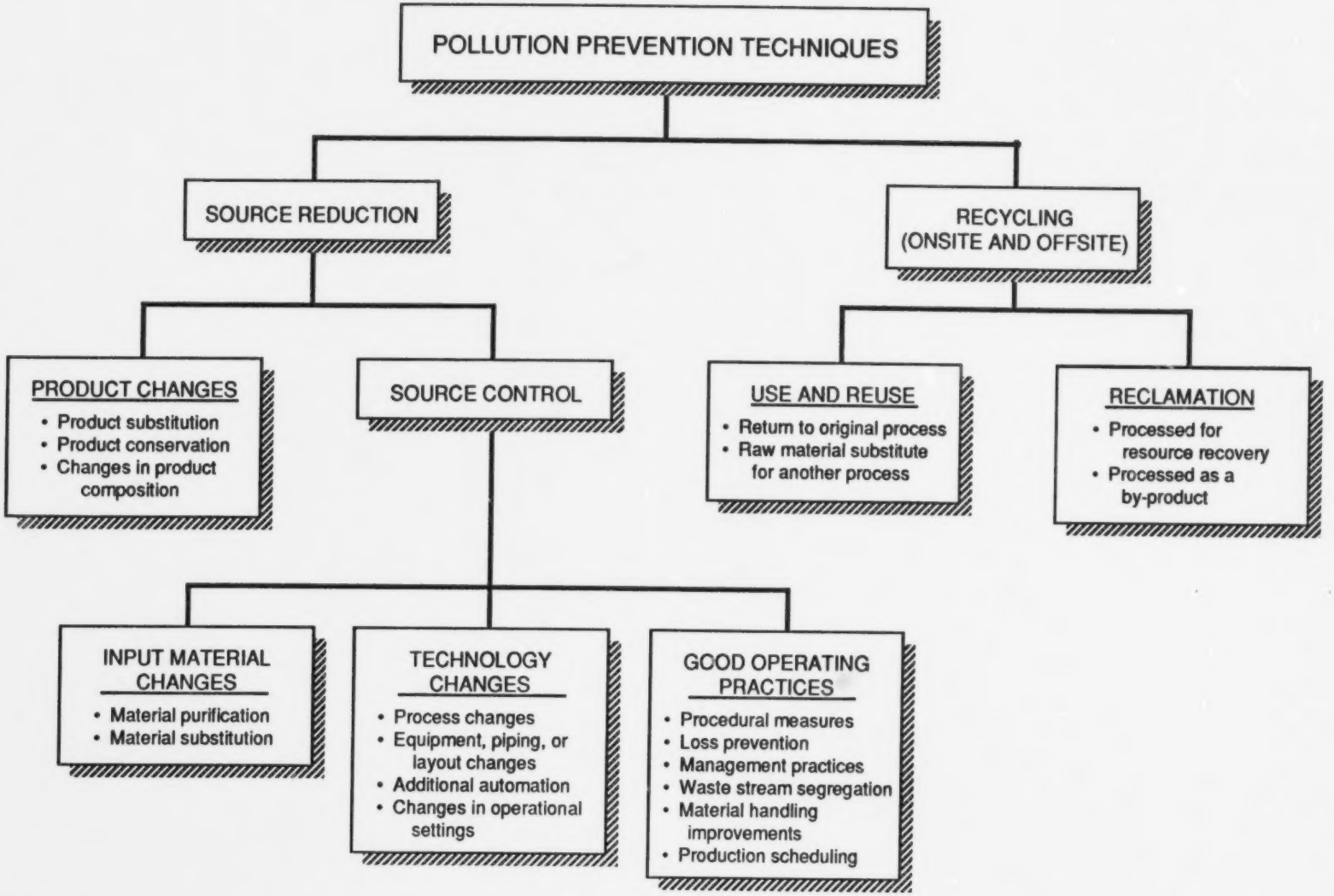


Figure 1. Waste reduction techniques.

would take time to develop, and many industries might postpone any action until mandatory requirements are defined.

The Report to Congress stressed that the most constructive role government could assume is to promote voluntary waste minimization by providing information, technology transfer, and assistance to waste generators. The Agency proposed a pollution-prevention program to encourage industry to accelerate efforts to reduce the generation of wastes through implementation of process changes and/or the incorporation of recycling methods.

In its efforts to pursue the objectives set forth by Congress, EPA has established a national program to effect waste minimization. This program is based on the five elements listed below [3].

1) Promoting waste reduction by transferring technical information to firms and State and local government technical assistance officers.

2) Encouraging the adoption of waste reduction by identifying, evaluating, and demonstrating appropriate technologies and by promoting the use of waste minimization assessments.

3) Keeping Congress advised on national progress on waste minimization.

4) Fostering development of State and local government waste-minimization programs.

5) Developing outreach and communication programs with the goal of raising awareness of the benefits of waste minimization within government, industry, and the public.

To accomplish some of these objectives, EPA recently established the Waste Minimization Branch (WMB) in its Office of Research and Development. The WMB is responsible for encouraging the development and adoption of technologies that result in a reduction in volume and/or toxicity of waste materials generated in the United States. Research, development, and demonstration activities undertaken by the WMB focus on the implementation of source reduction and other pollution-prevention technologies such as recycling for all wastes, including hazardous, nonhazardous, industrial, and municipal wastes.

The WMB also provides support to the operating programs of EPA and to State and municipal agencies in the development of policies and regulations related to pollution-prevention. Technical assistance concerning pollution-

prevention research activities is also provided by the WMB to other offices within EPA and the Federal government, to State and local governments, and to industry.

SECTION 3

THE WASTE REDUCTION INNOVATIVE TECHNOLOGY EVALUATION (WRITE) PROGRAM

OVERVIEW

The WRITE Program is designed to identify, evaluate, and/or demonstrate new ideas and technologies that lead to waste reduction. Its overall goal is to promote the national waste-minimization policy by the cooperative involvement of EPA with private industry in an effort to encourage the development and/or demonstration of effective technologies for waste minimization. The WRITE Program is broad in technical scope and addresses the reduction of pollutants across all environmental media: air, land, surface water, and ground water. Source reduction, defined as the reduction or elimination of releases through either production process changes or other source modifications, is a more desirable technique than recycling and is thus more strongly emphasized under the WRITE Program. The WRITE Program is directed and implemented by the WMB of the Risk Reduction Engineering Laboratory (RREL), a component of the Office of Research and Development (ORD) of the EPA.

For the purposes of this program, innovative waste-minimization technologies are defined as those technologies that represent an alternative approach to conventional waste management methods (i.e., incineration, land disposal, treatment, etc.). This approach involves substantially reducing the volume or toxicity of waste generated at the source and/or recycling or reusing the waste materials. In some cases, the technologies may incorporate novel modifications to a component of an existing process or operation.

As shown in Figure 2, the WRITE Program is composed of several subprograms. The "WRITE Pilot Program With State and Local Governments" is one of two evaluation subprograms and addresses immediate information transfer needs through cooperative efforts with State and local governments and industry.

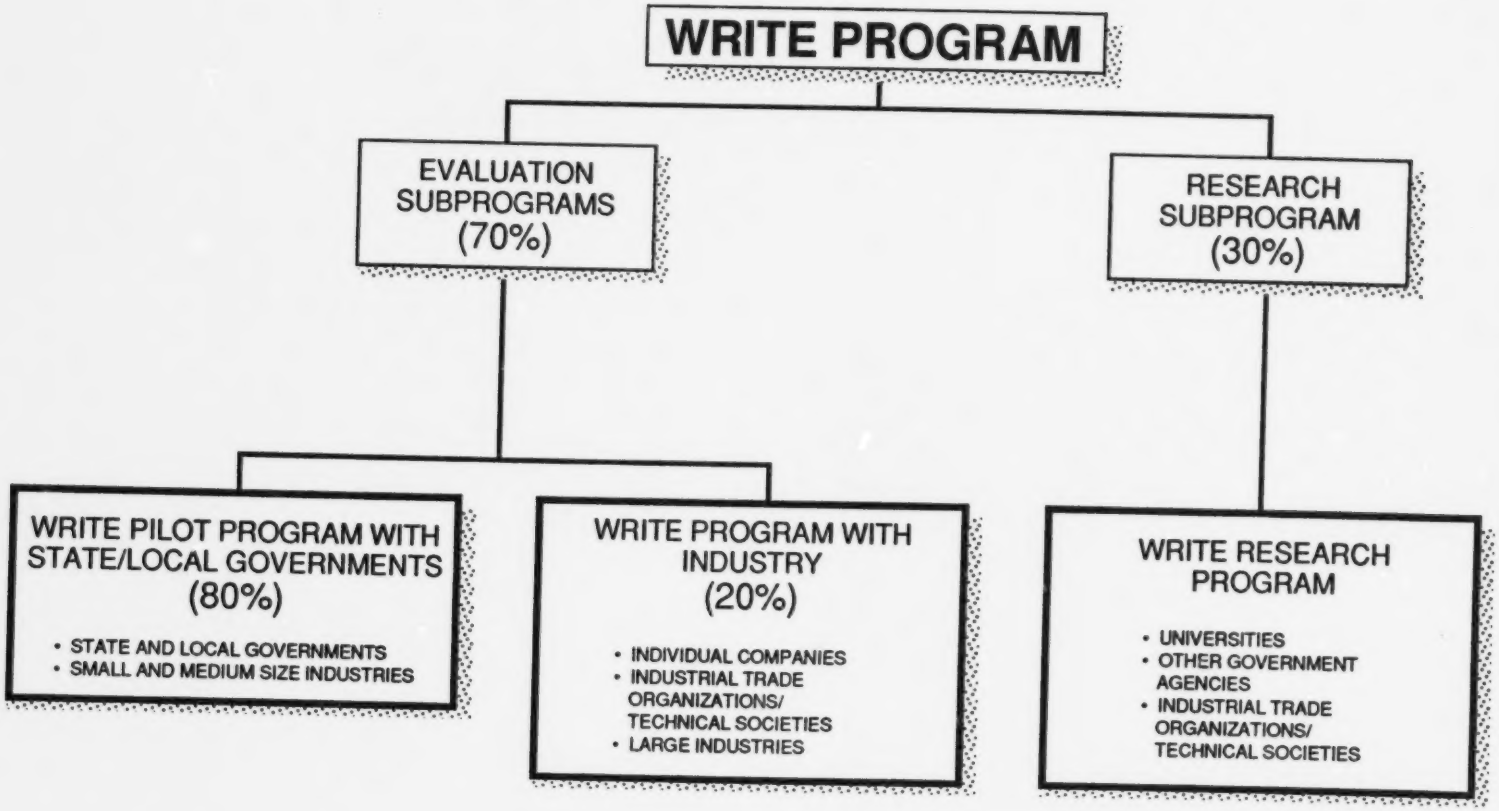

WRITE PROGRAM
EVALUATION SUBPROGRAMS (70%)
RESEARCH SUBPROGRAM (30%)
WRITE PILOT PROGRAM WITH STATE/LOCAL GOVERNMENTS (80%)
• STATE AND LOCAL GOVERNMENTS
• SMALL AND MEDIUM SIZE INDUSTRIES
WRITE PROGRAM WITH INDUSTRY (20%)
• INDIVIDUAL COMPANIES
• INDUSTRIAL TRADE ORGANIZATIONS/ TECHNICAL SOCIETIES
• LARGE INDUSTRIES
WRITE RESEARCH PROGRAM
• UNIVERSITIES
• OTHER GOVERNMENT AGENCIES
• INDUSTRIAL TRADE ORGANIZATIONS/ TECHNICAL SOCIETIES

Figure 2. Subprogram emphasis in the WRITE Program.

Under this pilot program, technical and economic evaluations are being conducted of manufacturing and processing operations in which waste-minimization technologies reduce the volume and/or toxicity of wastes generated. These evaluations are being provided through the joint efforts of EPA and various State and local governments. This joint approach was chosen because State and local governments are much more familiar with local industrial practices and regional manufacturing and economic interests, which can affect the potential success and widespread applicability of proposed waste minimization technologies.

The second evaluation subprogram, the "WRITE Program With Industry" focuses on evaluations of waste reduction technologies currently in use or under development by large industries. One of the objectives of this program is to encourage the transfer of knowledge and technology concerning pollutionprevention practices between large, mid-size, and small industries. Under the "WRITE Program With Industry", evaluations of waste reduction technologies are performed directly with industrial firms or through industrial trade associations and/or technical societies.

In addition to the two evaluation subprograms, the WRITE Program has a research subprogram. This subprogram, called the "WRITE Research Program", focuses on pollution-prevention research needs, i.e., the generation of data to allow the future demonstration of emerging new pollution-prevention techniques. Projects under this component of the WRITE Program will address various technical obstacles to waste reduction and to chemical-, waste-stream-, and industry-specific waste minimization issues. Research projects under this subprogram will be conducted with industrial firms, universities, other government agencies, technical societies, and industrial trade organizations. Additional information concerning the "WRITE Research Program" can be obtained from the WMB.

Because EPA is already devoting considerable effort and funding to waste treatment under other Agency programs [e.g., the Superfund Innovative Technology Evaluation (SITE) Program], efforts under the WRITE Program focus primarily on 1) source reduction through process modification and other means, and 2) recycling/recovery of waste materials for reuse. Innovative

modifications to existing processes (e.g., in-plant changes, process modifications, etc.), however, are considered.

PURPOSE AND OBJECTIVES OF THE WRITE PROGRAM

The purpose of the WRITE Program is to identify, develop, and evaluate, through engineering and economic assessments, innovative techniques for pollution prevention. Attention is directed toward methodologies with the potential for reducing the quantity and/or toxicity of waste produced at the source of generation, or to achieve practicable onsite reuse or recycling of waste materials. Strong consideration is given to the applicability of a technique on an industry-wide basis and across industries.

The objectives of the WRITE Program are as follows:

- To establish reliable performance and cost information on pollution prevention techniques by conducting evaluations or demonstrations of the more promising innovative technologies.
- To accomplish an early introduction of waste-reduction techniques into broad commercial practice.
- To encourage active participation of small- and medium-sized companies in evaluating and adopting pollution-prevention concepts by providing support to these companies through State and local government agencies.
- To encourage the transfer of knowledge and technology concerning pollution-prevention practices between large, medium-sized, and small industries.
- To provide solutions to important chemical-, wastestream-, and industry-specific pollution-prevention research needs.

SECTION 4

WRITE PILOT PROGRAM WITH STATE AND LOCAL GOVERNMENTS

The "WRITE Pilot Program With State and Local Governments" involves the cooperative efforts of EPA, State and local governments, private industry, and other organizations to encourage the development and demonstration of effective technologies for multimedia pollution prevention. The success of this pilot program will determine the future expansion of this part of the overall WRITE Program and the effectiveness of incorporating pollution-prevention technologies and practices in industry operations through federal and state cooperative efforts.

For Fiscal Year 1989 (10/1/88 - 9/30/89), the following factors provide the basis for this pilot program:

1) EPA will recruit approximately six to eight State/local governments to participate in this pilot program. This pilot program is not a competitive progam and, therefore, proposals are not being solicited.

2) Approximately $1,200,000 has been made available under this pilot program for cooperative agreements between EPA and State/local governments. Funding for this pilot program in fiscal years 1990 and 1991 will also be available.

3) Initial EPA funds of $100,000 will be made to each participating State/local government. The amount of additional funds provided to each State/local government will be determined on a case-by-case basis and will average approximately $100,000 per year for each State/local government. A maximum of $300,000 may be provided to each State/local government participating in this pilot program. Funds will be provided incrementally during the project period of the cooperative agreement.

4) Funds awarded to each State/local government may be expended by the State/local government over a period of up to 3 years, as appropriate.

5) State/local governments participating in this program are required to provide a 33 to 50 percent cost share (50 to 100 percent matching funds) or in-kind contributions. [For example, to receive an EPA award of $100,000, a State/local government must provide additional funds or in-kind goods or services of $50,000 to $100,000.]

RECRUITMENT OF STATE AND LOCAL GOVERNMENTS FOR PARTICIPATION IN PILOT PROGRAM

The EPA considered several factors in recruiting State and local governments to participate in this pilot program. These factors are summarized here.

1) Established waste-reduction program within a State/local government.

2) Demonstrated experience in cooperative research efforts with industries of varying size and type located within a State/local government.

3) Significant level of State/local government resources dedicated to waste-reduction activities. This includes the number of State/local government technical and administrative personnel and the existence of State/local government funds sufficient to meet cost share requirements.

4) Level of other Federal funds available to a State/local government for conducting waste minimization/reduction activities.

5) Geographical location and types of industries present within the area of a State/local government. For this pilot program, a concentrated effort was made to recruit State/local governments representing insofar as possible all regions of the United States as well as major industrial segments and waste categories. Table 2 lists the industries of primary interest under this pilot program. Table 3 identifies the regional breakdown of the United States used in recruiting State and local governments.

6) Types of chemicals and waste streams present within a State/local government as related to the chemicals/waste streams of priority concern to EPA. For example, wastes banned from land disposal are of high concern to EPA. Some of these wastes are listed in Table 4.

TABLE 2. INDUSTRIES OF PRIMARY INTEREST UNDER THE WRITE PROGRAM

Industry	SIC major group classification
Food	20
Textile	22
Lumber	24
Printing & Publishing	27
Chemicals	28
Petroleum	29
Fabricated Metals	34
Machinery Except Electric	35
Electronic & Electric	36
Transportation	37

TABLE 3. WRITE PROGRAM REGIONAL BREAKDOWN OF THE UNITED STATES

Region	States included
1	ME, MA, NH, VT, CT, RI
2	NY, NJ, Puerto Rico, Virgin Islands
3	DC, WV, DE, PA, MD
4	KY, FL, GA, SC, NC, AL, TN, MS
5	MN, WI, IL, IN, MI, OH
6	AR, LA, NM, OK, TX
7	NE, IA, MO, KS
8	SD, ND, MT, WY, UT, CO
9	NV, AR, CA, HI, American Samoa, Guam
10	AK, ID, OR, WA

TABLE 4. SIC CLASSIFICATION OF SOME FIRST-THIRD LAND BANNED WASTES.

WASTE CODE	SIC	INDUSTRY GROUP
F006	34	Fabricated Metal Products
F007	34	" " "
F008	34	" " "
F009	34	" " "
F019	34	" " "
K001	24	Lumber & Wood Products
K004	28	Chemical & Allied Products
K008	28	" " "
K011	28	" " "
K013	28	" " "
K014	28	" " "
K015	28	" " "
K016	28	" " "
K017	28	" " "
K018	28	" " "
K020	28	" " "
K021	28	" " "
K022	28	" " "
K024	28	" " "
K030	28	" " "
K031	28	" " "
K035	28	" " "
K044	28	" " "
K045	28	" " "
K047	28	" " "
K048	29	Petroleum & Coal Products
K049	29	" " "
K050	29	" " "
K051	29	" " "
K052	29	" " "
K060	29	" " "
K061	33	Primary Metal Industry
K062	33	" " "
K069	33	" " "
K071	28	Chemical & Allied Products
K073	28	" " "
K083	28	" " "
K084	28	" " "
K085	28	" " "
K086	28	" " "
K087	29	Petroleum & Coal Products
K099	28	Chemical & Allied Industry
K101	28	" " "
K102	28	" " "
K103	28	" " "
K104	28	" " "
K106	28	" " "

CRITERIA FOR SELECTION OF WASTE-REDUCTION TECHNOLOGIES FOR EVALUATION WITHIN A STATE/LOCAL GOVERNMENT

The selection criteria for waste minimization technologies will be developed on a case-by-case basis, depending on the type of application, industry segment, scale of demonstration, etc. Determination of the actual technologies evaluated under the "WRITE Pilot Program With State and Local Governments" will be made jointly by EPA and the State/local government. The technical criteria presented herein are examples of some that are important for the evaluation of many applications. This list is not complete in itself, but rather serves as a guide that should be considered in selecting technologies.

Technical Evaluation Criteria

Examples of technical evaluation criteria are as follows:

1. Type of Waste-Minimization Technology

   The objective of waste volume or toxicity reduction can be achieved by source reduction, waste recycling, waste reclamation, and treatment. Source reduction could entail, for example, product reformulation, product substitution, process modification, or equipment redesign. Waste recycling and reclamation could be on-site or offsite. Treatment involves end-of-pipe destruction or detoxification of wastes from various separation/concentration processes into harmless or less toxic substances. Under the WRITE program, only source reduction and recycling applications are considered; offsite reclamation or recycling and treatment technologies are not considered.

2. Status of Development

   Technical developments follow a hierarchy of successive steps as they proceed from the idea to commercial reality. Each step (e.g., documentation of the idea, bench-scale testing, pilot-scale testing, and sustained operation of integrated systems) has a unique set of attributes and characteristics that reflect the relative maturity of the development. The "WRITE Pilot Program With State and Local Governments" is concerned only with those technologies that have a relatively high maturity. The U.S. Department of Energy has developed a maturity index that can be used to determine relative maturity. This maturity index uses a numerical scale from 1 to 100. The scale is essentially arbitrary. Table 5 presents the scale of development of a technology, the corresponding maturity index, and associated developmental characteristics. This

TABLE 5. Maturity Index.

SCALE OF DEVELOPMENT	MATURITY INDEX	CHARACTERISTICS
Commercial	100	Specific private sector interest in system application - commercial operation
	97	Specific private sector interest in system application - construction complete
	93	Specific private sector interest in system application - system design complete
	92	Specific private sector interest in system application - contract awarded
	91	Specific private sector interest in system application - letter of intent signed
Demonstrational	90	Final format of detailed system cost estimation complete for commercial plant
	85	Final format for detailed design of replicate systems completed
	83	Final format for detailed design of replicate systems possible (data available)
	80	Successfully sustained operation of prototype or modified system meeting all criteria listed below for prototype system; duration of operation sufficient to access time-based effects such as erosion, corrosion, catalyst deactivation, fatigue failures, etc. for determination of plant life
Prototype	70	Products/functions of prototype system evaluated in intended commercial application
	69	Sustained operation of prototype system at design capacity, at design conditions using design subsystem properly operating and produced design specification products
	64	Specific prototype facility operated
	60	Specific prototype facility constructed
	42	Specific prototype facility designed
	37	Specific prototype facility conceptualized
Pilot Plant	35	Cost estimate complete based on most up-to-date data
	34	Detailed engineering design complete for pilot plant based on most up-to-date data
	30	Integrated pilot plant operated
	29	Integrated pilot plant constructed
	27	Integrated pilot plant designed
	26	Integrated subscale pilot plant operated
	25	Integrated subscale pilot plant constructed
	24	Integrated subscale pilot plant designed
	23	Non-integrated pilot plant operated
	22	Non-integrated pilot plant constructed
	21	Non-integrated pilot plant designed
Proof-of-concept	20	Detailed engineering scale cost analysis complete
	18	Integrated system engineering design and specification complete
	17	System unit operations engineering design and specification complete
	16	System engineering design analysis complete
	15	System engineering design conceptualized
	14	Engineering design data sufficient for system design collected and analyzed
Process Development Unit	13	Unit operation elements operated
	12	Unit operation elements constructed
	11	Unit operation elements designed
	10	Mode of operation of unit operation elements detailed
	9	System unit operation elements defined
Bench	8	Extensive experimental data and evaluation completed on all major system elements; experiments and analysis conducted to the point of mapping system variable responses and optimization
	7	Extensive experimental data on all major system elements colleced and analyzed
	6	Laboratory scale/style experiments conducted; initial system data collected
	5	Single principle experiments conducted to verify essential system elements
	4	Detailed documentation of idea, principles, and other essential system elements
	3	Physical, chemical, electrical, etc., priciples assessed
	2	Idea developed to encompass a definable system
	1	Describable idea

ranking system can be used to decide the status of a waste-minimization technology. The technologies considered under the "WRITE Pilot Program With State and Local Governments" program will have a maturity index equal to or above 29.

3. Unique Nature of the Technology

The WRITE program focuses on first-of-a-kind applications of a technology. If a technology has been previously demonstrated and its cost/performance documented, it may not be considered under the "WRITE Pilot Program with States and Local Governments".

4. Applications

Three types of applications will be considered under this criterion:

- Capability of the technology to minimize one or more of the priority wastes--Priority wastes include those that have been subjected to land disposal ban. Any process that can minimize these waste streams will be given special consideration.

- Range of other potential applications--A waste minimization technique for one process could have applications for another process. Many chemical manufacturing processes follow similar reaction mechanisms; therefore, a modification for one may often be theoretically applicable to other similar reactions. For example, benzene and toluene chlorination reactions follow a similar mechanism; thus, a modification applicable to benzene chlorination could be applied to toluene chlorination with similar results.

- Size of the industry--One of the objectives of the "WRITE Pilot Program With State and Local Governments" is to promote waste minimization in small- and medium-scale operations. Thus, technologies/concepts targeting this industrial sector will have special consideration.

5. Source-Reduction-Performance Capability

The extent of waste volume or toxicity reduction achieved is the main measure of performance capability; however, this criterion has several dimensions to it.

- The extent of waste volume or toxicity reduction is the measure of the performance capability, i.e., efficiency. Depending on the type of application, the extent of waste reduction achieved will change; hence, there is no definitive minimum

standard for this parameter. Within similar types of applications, however, a technology with a higher efficiency will receive higher priority.

- The effect of the process modification on the product quality. Technologies of greatest interest are those where no discernible difference is detected in the quality of the final product.

6. Extent of Process Modification

The technology could involve a process and/or equipment modification. The modification may involve only a minor change in a process operation and/or a small equipment change. A significant modification could involve an extensive retrofit of an existing piece of equipment or process or construction of a new equipment facility. Smaller, more cost effective modifications are preferred.

7. Cost-Effectiveness of the Technology

An estimate of the cost-effectiveness of the technology will be determined by comparing the costs of adopting the innovative technology versus the status quo or conventional technology. If alternative waste minimization techniques exist, they will be compared to the proposed technology and the option providing the greatest waste reduction per dollar (calculated by methods such as payback period, cost/benefit analysis, internal rate of return, etc.) will be given preference.

8. Process Safety and Health Considerations

Process safety and associated health considerations play an essential role in the selection of a technology for evaluation. Each technology must be carefully evaluated for possible dangerous operating situations (e.g., explosions, runaway reactions, fire hazards). Moreover, there must be no health risks arising (for example, from the possibilities of toxic emissions), during either normal or abnormal operations.

9. Cost to the EPA and State/Local Government

The cost to the EPA and the State/local governments of an evaluation of a technology is obviously an important consideration. Such costs usually depend primarily on the amount and difficulty of the analytical work required and the complexity of the engineering evaluation steps necessary. If the demonstration entails developing new analytical methods for which standard methods do not exist or significantly modifying existing sampling and analytical methods, or if the engineering evaluation required is highly

detailed or complex, evaluation costs to the EPA and the State/local government may be unacceptably high. Limited program funds make the cost of conducting a demonstration an important consideration.

Other Criteria

Examples of other criteria are as follows:

10. Demonstrator's Qualifications

    The technical qualifications (past experience, technical personnel) and the financial capabilities of the demonstrator are considered during the selection process. The EPA and State/local governments provide funding only for the analytical and evaluation work. Thus, the demonstrator must be financially capable of conducting the field demonstration itself.

11. Legal/Contractual Issues

    The EPA and State/local governments consider legal/contractual issues such as patent rights, proprietary information, etc. Although patented technologies can be evaluated, all pertinent information regarding the technology must be publicly available. Also, the technology must be available for use (even though royalties might be applicable).

12. Length of the Project

    Technologies are preferred for which selection, evaluation, and report preparation can be completed within a period of no greater than 12 months.

Worth Assessment Model

A worth assessment model is one of the decision tools EPA and the State/local governments may use to evaluate and rank potential waste minimization technologies. As noted earlier, each technology must comply with the following requirements to be considered for evaluation under the "WRITE Pilot Program With State and Local Governments". The technology must:

- Involve source reduction or recycling.
- Be within the prescribed maturity index limits.
- Be used in a unique, first-of-the-kind application.

Also, all major legal/contractual issues will have to be resolved before the technology can be evaluated.

Technologies meeting the preceding criteria will be analyzed further with the worth assessment model presented in Figure 3. The technical merit of each technology will be evaluated with respect to the following criteria: status of development (maturity index), applications, performance capability, extent of process/equipment modification, cost-effectiveness, health and safety, and cost to the EPA and State/local governments.

EVALUATION OF A WASTE REDUCTION TECHNOLOGY

Under the "WRITE Pilot Program With State and Local Governments", an initial award of $100,000 will be given to each participating State and local government. As technologies are chosen for evaluation within a State/local government, EPA will meet with each State/local government to determine if they have the technical personnel required to conduct the technical and economic evaluations. If a State/local government has these resources available to the program, EPA will continue to provide full funding for the remaining years of the cooperative agreement (average Federal funding level of $100,000 per year) directly to the State/local government. If, however, a State/local government is unable to conduct these evaluations, EPA will reduce the subsequent year funding level and use the balance of the funds to provide an EPA technical contractor to perform the evaluations. Under this scenario, funds would be provided to the State/local government to contact industries, to assist in the selection of technologies, and to coordinate the performance of the evaluations and the reporting of results. For this reason, the outyear funding level for each State/local government recruited under the "WRITE Pilot Program With State and Local Governments" may vary and will be decided on a case-by-case basis.

An average of five technologies are expected to be evaluated during the 3-year period of this pilot program with each State/local government. Table 6 shows a typical projected schedule for conducting a waste-reduction technology evaluation. It is anticipated that each evaluation will be completed within one year or less. Table 6 serves as a guide and illustrates several of the activities that may be required in conducting a technology evaluation. Depending on the complexity of a technology, an evaluation may be completed in significantly less than one year if items shown in this table are not

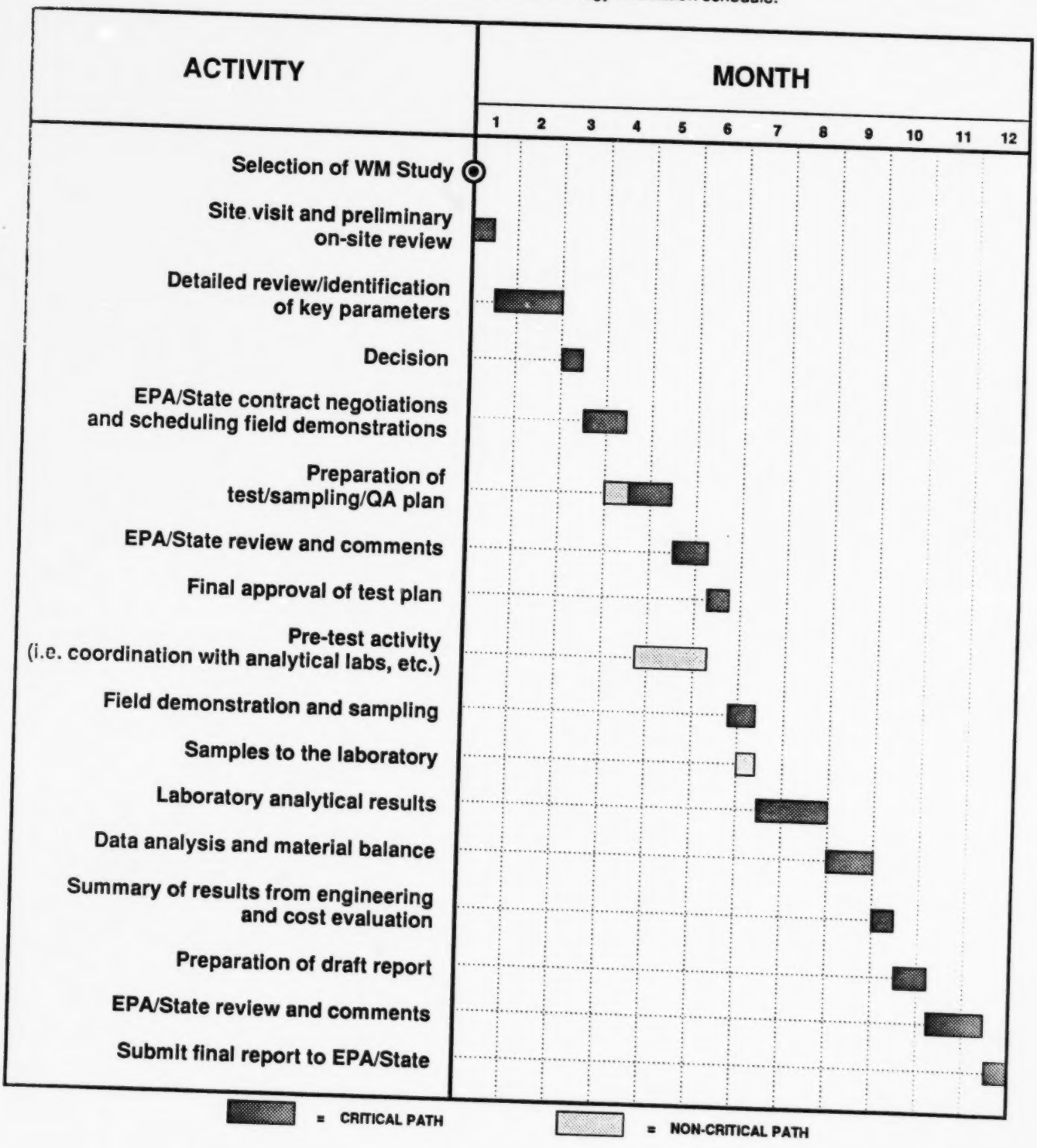
Criteria		Ranking	Weight
Status of Development			5
Maturity index 0-28		(0.0)	
Maturity index 29-35		(0.1)	
Maturity index 37-70		(0.5)	
Maturity index 80-90		(1.0)	
Maturity index 90-100		(0.2)	
Applications			20
Priority Waste		(0.3)	
- High	(1.0)		
- Moderate	(0.5)		
- None	(0.1)		
Range of other applications		(0.4)	
- More than one industry/ process	(1.0)		
- One industry/process	(0.5)		
- Site-specific application	(0.0)		
Size of Industry		(0.3)	
- Small Scale	(1.0)		
- Medium Scale	(1.0)		
- Large Scale	(0.5)		
Source Reduction Performance Capability			20
Significant reduction		(1.0)	
Moderate		(0.5)	
Slight improvement		(0.1)	
No change		(0.0)	
Extent of Process/Equipment Modification			10
Low		(1.0)	
Moderate		(0.5)	
Significant		(0.1)	
Cost-Effectiveness of Technology			15
Significant		(1.0)	
Moderate		(0.5)	
Slightly better		(0.1)	
Poor		(0.0)	

Figure 3. Worth assessment model for evaluation of a waste reduction technology.

Safety and Health Considerations			5
Beneficial		(1.0)	
Same as conventional		(0.5)	
Deleterious, but solvable		(0.1)	
Very hazardous		(0.0)	
Cost to EPA and State/Local Governments			5
Low		(1.0)	
Moderate		(0.5)	
High		(0.0)	
Demonstrator's Qualifications			10
Technical		(0.5)	
- Excellent	(1.0)		
- Moderate	(0.5)		
- Poor	(0.1)		
Financial Condition		(0.5)	
- Excellent	(1.0)		
- Moderate	(0.5)		
- Poor	(0.1)		
Legal/Contractual Issues			5
None		(1.0)	
Solvable		(0.5)	
Serious		(0.1)	
Length of Evaluation			5
0 to 6 months		(1.0)	
6 to 12 months		(1.0)	
Greater than 12 months		(0.1)	
			100

Figure 3. Worth assessment model for evaluation of a waste reduction technology (continued).

TABLE 6. Waste reduction technology evaluation schedule.



required. The following subsections describe the scope of the engineering and economic evaluations and procedures for reporting the results and conclusions.

Engineering and Economic Evaluations

The technical evaluation establishes the status of the technology with respect to each technical criterion. This evaluation involves an in-depth study of the process, a literature review, material and energy balance computations, a field demonstration, and cost estimation.

It is recognized that the short time involved in conducting the evaluation of a technology precludes examination of long-term operating data for evaluation of life-cycle costs and long-term operating problems. Also, the long-term data required to assess maintenance and repair costs for most of the technologies studied may not be available. These evaluation shortcomings are accepted; however, they will be compensated for by making engineering estimates of the impacts and costs of long-term operation.

Once a technology has been selected for demonstration, a detailed test plan will be developed and coordinated with EPA, the State/local governments and the developer. At a minimum, this plan addresses the following:

1. Testing Program Duration and Schedule

   The developer will propose the duration of the demonstration to establish the relevant parameters for evaluating process performance and cost. The State/local governments and EPA will discuss and finalize the evaluation schedule with the developer.

2. Development of Detailed Evaluation Design

   The developer, State/local governments, and EPA (with the assistance of a contractor, if required) will develop a detailed evaluation design. The evaluation will be designed to define the limits of the most useful range of performance and the cost-effectiveness of the proposed technology. It will also provide for collection of scientifically valid data on process operating parameters, flow rates, controls, process stream concentrations, etc.

3. Sampling and Analytical Procedures

   The State/local governments or the EPA contractor will be responsible for the coordination and development of a sampling and analysis plan that is scientifically adequate to support the claims for the proposed technology and to evaluate its effectiveness.

4. Health and Safety Concerns

A health and safety plan will be prepared by the State/local governments or the EPA contractor in conjunction with the developer. This Plan will discuss necessary provisions for medical monitoring of operating and management personnel, levels of worker protection, emergency procedures, etc.

In addition to the development of a test plan, the State/local governments and/or the EPA contractor will work with the developer in preparing a Quality Assurance (QA) Site Plan to ensure that the data are of known and acceptable quality for their intended use. All data collected under the "WRITE Pilot Program With State and Local Governments" will be of EPA Category III or IV level. Topics often addressed in a quality assurance plan include:

- Project description and intended use of data
- Organization chart and delineation of QA/QC responsibilities
- Data quality objectives for critical measurements
- Sampling procedures
- Analytical procedures
- Data reduction, validation, analysis, and reporting
- Internal QC checks
- Plans for system and performance audits
- Calculations of data quality indicators
- Corrective action procedures
- QA/QC reports

To assist in the implementation of this pilot program, EPA will prepare a general Quality Assurance Program Plan addressing data quality objectives, general sampling and analysis procedures, reporting and documentation requirements, etc., for the "WRITE Pilot Program With State and Local Governments". This QA Program Plan will be provided to each State/local government to assist them in preparing QA Site Plans.

Example of Information Obtained From An Engineering Evaluation

Presented here is an example of the types of information gathered in an engineering evaluation of a waste minimization technology. The example concerns the modification of a cold solvent cleaning process.

In the cold cleaning of ball bearings with solvents, using a two-step countercurrent cleaning sequence can increase the cleaning efficiency. It

can also substantially reduce the solvent requirement and, hence, the waste generation. This process does not involve substantial equipment modification. Material balance calculations indicate a waste reduction of 50 percent and a 33 percent reduction in fresh solvent requirements [4]. Table 7 presents an overview of an engineering and cost evaluation for this process modification. Similar evaluations can be performed on any technology for waste minimization.

Report of Evaluation Results

After the evaluation of a waste-minimization technology has been completed, a report presenting the findings and conclusions of the evaluation will be prepared and submitted to EPA. An example outline showing the major sections of such a report is presented in Figure 4. In addition to a report summarizing each evaluation, the State/local governments will prepare an annual report detailing activities performed under the pilot program and reporting on the status of each evaluation. At the conclusion of the cooperative agreement, all evaluation reports will be consolidated into one report describing waste-reduction activities.

The EPA will hold a national meeting, where the results of all waste-reduction evaluation studies underway through the "WRITE Pilot Program With State and Local Governments" will be presented and discussed. One of the objectives of such a meeting is to provide a national forum to discuss and promote the projects and to encourage the use of new technologies that have proven to be successful in the reduction of waste generation.

In addition, as research results are available, workshops and seminars emphasizing regional waste-minimization issues and waste-reduction practices for specific industries will be conducted. These workshops and seminars will be interfaced with the dissemination of other research findings and activities ongoing in the Waste Minimization Branch.

TABLE 7. SUMMARY OF ENGINEERING EVALUATION FOR COLD SOLVENT CLEANING PROCESS MODIFICATION

Type of application	Process modification
Stage of development	Demonstration
Unique nature of technology	First-of-a-kind demonstration
Applications	Reduces hazardous waste generation in the cold cleaning operations of the parts cleaning industry, which is a medium/small-scale operation.
Performance	Achieves 50% waste reduction by reducing the fresh solvent requirement by 33% [4].
Need for new equipment	Requires essentially only minor equipment modification.
Cost-effectiveness of technology	Added capital costs = $ 600 Net operating savings = $ 380 per year Payback period = 1.6 years Note: Net operating savings include savings resulting from reduced waste disposal, reduced solvent requirement, and operation and maintenance expense.
Safety & health	Properly designed system is considered safe. Metal cleaning systems are routinely used in industry without any safety or health problems.

EXECUTIVE SUMMARY

I. INTRODUCTION

II. TECHNOLOGY DESCRIPTION

III. DESCRIPTION OF TECHNICAL AND ECONOMIC EVALUATION

IV. SAMPLING AND ANALYSIS PLAN

V. DATA SUMMARY AND ANALYSIS

- A. HISTORICAL DATA ON FACILITY
- B. OPERATING DATA SUMMARY
- C. PERFORMANCE AND ANALYTICAL RESULTS
- D. ECONOMIC EVALUATION

VI. EVALUATION SUMMARY AND CONCLUSIONS

APPENDIX:

QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES AND RESULTS

Figure 4. Example outline for a Waste Reduction Evaluation Report.

SECTION 5

ADDITIONAL EPA RESEARCH, DEVELOPMENT, AND DEMONSTRATION POLLUTION PREVENTION PROGRAMS

The WRITE Program is one of several activities currently being undertaken by EPA to address the Agency's goal of implementation of a national pollution-prevention policy. A summary of some additional EPA research programs and related activities is provided herein.

To encourage the identification, development, and demonstration of processes and technologies that result in less waste being generated, EPA's Office of Research and Development (ORD) has initiated the programs summarized in this section. These programs are designed to be the cornerstone of the Agency's pollution-prevention research and demonstration program and will provide sorely needed data on new technologies to the generating sectors. Direction and implementation of these programs are being undertaken by the Waste Minimization Branch of the Risk Reduction Engineering Laboratory of ORD in Cincinnati, Ohio.

Reducing the generation of industrial and other wastes can be achieved in many ways. Process chemistry can be changed; potential waste streams can be recycled within a manufacturing process or back into the process; process technology and/or equipment can be modified to produce products more efficiently, resulting in less waste; plant operations, i.e., "housekeeping" methods, can be changed or controlled to produce fewer and smaller waste streams or less waste in general; changes in raw materials (feedstocks) can lead to fewer waste streams or less-hazardous waste streams; finally, changes in the end products from manufacturing operations can, in some instances, be made so as to affect the types and quantities of wastes emitted. The EPA waste minimization research, development, and demonstration programs described below address several of these issues.

Waste Reduction Evaluations at Federal Sites (WREAFS) Program

The Waste Reduction Evaluations at Federal Sites (WREAFS) Program consists of a series of demonstration and evaluation projects for waste reduction conducted cooperatively by EPA and various parts of the Department of Defense (DOD), Department of Energy (DOE), and other Federal agencies. The WREAFS Program focuses on waste-minimization research opportunities and technical information at Federal sites.

Many Federal activities have established waste minimization plans and programs in the past few years. For example, an overall goal within DOD is to reduce hazardous waste generation a total of 50 percent by 1992 compared with 1985 levels. Several operation and process opportunities for waste-minimization practices exist at Federal sites that will reduce hazardous waste and result in cost avoidance or cost reduction as well as productivity, environmental, and human health benefits. Waste-minimization opportunities can be applied throughout the Federal community in fabrication, production, and/or maintenance processes, depending on the waste-generating function. Industrial activities that support Federal activities through in-house or contract efforts (whether on-site or offsite) are generally the same activities as those within the private sector. The application may vary, depending on the final product; however, waste-minimization techniques and technologies should work in both the Federal or private sector. The WREAFS Program encourages the use of any unclassified Federal and industrial waste minimization information to the maximum extent practicable.

Further information concerning the WREAFS Program can be obtained by contacting James S. Bridges (513-569-7683) of the Waste Minimization Branch of EPA.

The Waste Reduction Assessments Program (WRAP)

The Waste Reduction Assessments Program (WRAP) encourages the industrial community's use of waste-minimization assessments. The WRAP Program is designed to assist users in applying waste-minimization assessments as a tool for identifying options for reducing waste generation. These assessments may be conducted internally by in-house teams or through external means, such as

consultants, with in-house assistance. Preliminary assessments will be followed by long-term studies to verify the lasting effectiveness of waste-minimization applications.

Initial efforts in the Program will demonstrate and evaluate EPA's Manual for Waste Minimization Opportunity Assessments across a broad scope of industrial settings. The development of standard procedures applicable over a broad range of business sizes and types will provide a uniform basis for those in decision-making roles to implement, postpone, or reject identified options. Experience with the assessment protocol will demonstrate the effectiveness of translating incentives and disincentives for waste minimization into quantifiable factors that can be ranked objectively. Where appropriate, evaluations will conclude with revisions to the manual. Suggested amendments will be transferred to State and Regional waste-minimization programs. Expected expanded efforts within the Program include tailoring the EPA manual to reflect the needs of individual industries.

Further information concerning the WRAP Program can be obtained by contacting Mary Ann Curran (513-569-7837) of the Waste Minimization Branch of EPA.

Waste Reduction Institute for Scientists and Engineers (WRISE)

The Waste Reduction Institute for Scientists and Engineers is a joint university/EPA-sponsored institute comprised of senior individuals knowledgeable in the principles and practices of waste-minimization. Many of the Institute members probably will be retired from distinguished careers in industry. The overall purpose of the group will be to counsel EPA with respect to its waste-minimization activities and to serve as liaisons to private industry generators that the Agency wishes to encourage to adopt and demonstrate waste-reduction techniques. Review and comment on individual project documents and participation as lecturers in waste-minimization seminars and in the Waste Reduction Assessments Program are envisioned as activities to be undertaken by the Institute personnel.

Further information concerning the WRISE Program can be obtained by contacting Dr. David G. Stephan (513-569-7896) of the Waste Minimization Branch of EPA.

Written correspondence and inquiries for additional information concerning Research and Development programs in waste minimization should be directed to:

Waste Minimization Branch
Risk Reduction Engineering Laboratory
U.S. Environmental Protection Agency
26 W. Martin L. King Dr.
Cincinnati, OH 45268
(513-569-7512)
(FTS 684-7512)

REFERENCES

1. U.S. Congress. Hazardous and Solid Waste Amendments. Washington, D.C. 1984.

2. U.S. Environmental Protection Agency. Report to Congress, Minimization of Hazardous Wastes. EPA/530-SW-86-033. Office of Solid Waste, Washington, D.C. 1986.

3. Freeman, H. M., and J. Lounsbury. The U.S. EPA Hazardous Waste Minimization Program. American Institute of Chemical Engineers Annual Meeting, Washington, D.C. 1988.

4. Jacobs Engineering. Waste Minimization Audit Report: Case Studies of Minimization of Solvent Waste from Parts Cleaning and from Electronic Capacitor Manufacturing Operations, Project Summary. EPA/600/52-87/057. Office of Research and Development (ORD), Cincinnati, OH. 1987.